

CLAIMS

1. A scanning system based on the principle of confocal microscopy, comprising a light source (1), imaging optics (4) for focusing the light (5) emitted from the light source (1) onto an object (6) to be scanned, furthermore comprising an image detector (10) to detect the light (7) of a point (6') on the object (6) that is backscattered from the object (6) and that passes back through the same imaging optics (4) to at least two radiation-sensitive sensor elements (13, 14) (pixel), characterized in that
 - at least two sensor elements (13, 14) are assigned to an object point irradiated via the imaging optics (4, 9),
 - means (11) for changing the length of the optical path (d) are provided in the beam path between the aperture array (3) and the object (6), which optical distance (d) of the image plane can be varied in a specified manner, and
 - means are provided which influence the accumulation of charges (Q_{13}, Q_{14}) in the at least two sensor elements (13, 14) from the intensity of light of the observed beam path (7) during the exposure period (T) in such a manner that a correlation with the optical distance (d) of the image plane from the imaging optics (4) is created so that an altitude coordinate (z_s) of the object (6) can be reconstructed from the distribution of the levels of intensity acquired from the at least two sensor elements (13, 14) during an exposure period (T).
2. A scanning system as defined in Claim 1, characterized in that said means alter the sensitivity of said sensor elements (13, 14) and/or the translucence in the observed beam path (7) between said imaging optics (4) and said image detector (10), particularly said exposed area of said at least two sensor elements (13, 14).
3. A scanning system as defined in Claim 1 or Claim 2, characterized in that an aperture array (3) is provided for the creation of a brightness distribution on said object (6).
4. A scanning system as defined in Claim 3, characterized in that by means of said aperture array (3) a plurality of object points (6') can be detected, there being provided at least as many groups of sensor elements (13, 14) as there are object points (6') to be detected.

5. A scanning system as defined in any one of Claims 1 to 4, characterized in that means for deflecting (8) said observed beam path (7) are disposed in said observed beam path (7) between said object (6) and said sensors (10).
6. A scanning system as defined in Claim 5, characterized in that said deflecting means (8) is a beam splitter.
7. A scanning system as defined in Claim 5 or Claim 6, characterized in that said deflecting means (8) is disposed between said imaging optics (4) and said light source (1).
8. A scanning system as defined in Claim 3 or Claim 4 in conjunction with Claim 5 or 6, characterized in that said deflecting means (8) is disposed between said aperture array (3) and said light source (1).
9. A scanning system as defined in Claim 3, characterized in that a moveable aperture (12) is provided which at least partially shades said sensor elements (13, 14) depending on the amount of movement of said aperture.
10. A scanning system as defined in Claim 9, characterized in that said aperture (12) is designed such that movement of said aperture (12) causes a reduction of the shading of the at least one sensor element (13) and an increase in the shading of said at least one other sensor element (14).
11. A scanning system as defined in Claim 9 or Claim 10, characterized in that said aperture (12) shades, in an initial position, a part of said sensor elements (13) completely and, in an end position, another part of said sensor elements (14) completely and, in an intermediate position, shades both a part of certain sensor elements (13) and a part of the other certain sensor elements (14).
12. A scanning system as defined in any one of Claims 2 and from 9 to 11, characterized in that the degree of shading of said part of said sensor element (13) is complementary to the degree of non-shading of the other part of said sensor element (14).

13. A scanning system as defined in any one of Claims 2 to 8, characterized in that said means consists of an electronically controlled optical element (25) of variable translucence, in particular an LCD element.
14. A scanning system as defined in any one of Claims 3 to 13, characterized in that said aperture array (3) is designed for two-dimensional scanning of said object (6).
15. A scanning system as defined in Claim 14, characterized in that regulating means are provided for adjusting the position of said aperture array (3) such that regions not imaged in a first scan due to the pulse duty ratio of said aperture array (3) are imaged in a second scan.
16. A scanning system as defined in any one of Claims 1 to 14, characterized in that said image detector (10) is a line sensor (10.2).
17. A scanning system as defined in any one of Claims 1 to 14, characterized in that said image detector (10) a flat panel sensor (10.3).
18. A scanning system as defined in any one of Claims 1 to 17, characterized in that said image detector (10) is in the form of a CCD sensor.
19. A scanning system as defined in any one of Claims 1 to 17, characterized in that said image detector (10) is in the form of a CMOS sensor.
20. A scanning system as defined in any one of Claims 1 to 11, characterized in that said sensor elements (13, 14) are disposed on separated image detectors (10, 10') and a beam splitter (24) is provided in the observed beam path which transfers the same image to said second image detector (10'), cross-fading between the two image detectors (10, 10') being effected by means of electronic and/or optical auxiliaries during the scanning period (T).
21. A scanning configuration as defined in any one of Claims 1 to 12, characterized in that at least two sensor elements (13, 14) are used and the sensitivity of one part of said sensor elements (13) increases while that of the other part of said sensor elements (14) decreases with increased adjustment.

22. A scanning configuration as defined in any one of Claims 1 to 20, characterized in that the average scanning distance of said aperture array (3) is in accord with the desired measuring accuracy.
23. A scanning method based on the principle of confocal microscopy, in which light (5) is emitted from a light source (1) onto an object (6) to be scanned, which the light (5) is focused by imaging optics (4), and also in which the light (7) of an object point (6') backscattered from the object (6) and passed back through the same imaging optics (4) is received by an image detector (10) with has at least two radiation-sensitive sensor elements (13.14), characterized in that
 - at least two sensor elements (13, 14) are assigned to an object point illuminated via the imaging optics (4, 9),
 - the optical distance (d) of the image plane is varied during the exposure period (T) in a specific manner via means (11) disposed in the optical path between the aperture array (3) and the object (6), and
 - the relationship between the accumulation of charges (Q_{13}, Q_{14}) produced in the at least two sensor elements (13, 14) and representing the intensity of the light in the observed beam path (7) can be modified such that a correlation between said accumulation and the optical distance (d) of the image plane from the imaging optics (4) is produced such that an altitude coordinate (z_s) of the object (6) can be reconstructed from the distribution of the levels of intensity acquired by the at least two sensor elements (13, 14) during an exposure period (T).